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भारतीय मानक

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Indian Standard

LPG OPERATED INTERNAL COMBUSTION ENGINES — SAFETY AND PERFORMANCE REQUIREMENTS — SPECIFICATION

ICS 13.240; 27.020; 29.160.20; 75.160.30

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

August 2013 **Price Group 3**

Automotive Prime Movers, Transmission, Steering Systems and Internal Combustion Engines Sectional Committee, TED 2

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Prime Movers, Transmission, Steering Systems and Internal Combustion Engines Sectional Committee had been approved by the Transport Engineering Division Council.

While IS 7347 : 1974 ‘Specification for performance of small size spark ignition engines for agricultural sprayer and similar application’, covers the performance requirements of IC engines operated with liquid fuels this standard covers the performance and safety requirements of LPG operated IC engines for use with generators, agricultural pumps, sprayers or any other similar stationary application.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

LPG OPERATED INTERNAL COMBUSTION ENGINES — SAFETY AND PERFORMANCE REQUIREMENTS — SPECIFICATION

1 SCOPE

This standard specifies the safety and performance requirements for LPG operated internal combustion engines for use with generators, agricultural pumps, sprayers or any other similar stationary application.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard listed below:

IS No.	*Title*
3196 (Part 1) : 2006	Welded low carbon steel cylinders exceeding 5 litre water capacity for low pressure liquefiable gases: Part 1 Cylinders for liquefied petroleum gases (LPG) — Specification (*fifth revision*)
4786 : 2006	Specification for variable high pressure regulators for use with liquefied petroleum gases
7347 : 1974	Specification for performance of small size spark ignition engines for agricultural sprayer and similar application
8737 : 1995	Valve fittings for use with liquefied petroleum gas (LPG) cylinders of more than 5 litre water capacity — Specification (*first revision*)
9573 : 1998	Rubber hose for liquefied petroleum gas (LPG) — Specification (*second revision*)
9798 : 1995	Low pressure regulators for use with liquefied petroleum gas (LPG) mixtures — Specification (*first revision*)
ECE R-67	Performance evaluation of LPG regulator/vaporizer

3 TECHNICAL SPECIFICATION OF LPG KIT

The manufacturer shall submit the detailed technical specification of LPG kit used in the LPG operated IC Engine in the format given in Annex A.

4 SAFETY REQUIREMENTS

4.1 General Design Requirements

4.1.1 The LPG fuel system components shall comply with this standard and the relevant component standard. Equipment and systems approved by the relevant Statutory Authority/Test Agency shall be used.

4.1.2 All fuel system components shall fulfill the following conditions:

a) They shall withstand the environmental temperatures and other environmental conditions safely during their operational life.
b) They shall be located with full guard for anticipated damage while the engine is being used safely.
c) They shall be so located so as not to suffer damage due to corrosion.
d) Distance between the exhaust line, muffler and fuel line shall be adequate.
e) They should not react with LPG mixture.
f) Proper ventilation should be provided so that in case of any leakage the entrapped gas escapes to the atmosphere.

4.1.3 Gas cylinder valve shall be located with suitable protection in an accessible and safe place.

4.1.4 The automatic shut-off valve shall be in closed position when engine is not running and only be open when the engine is cranking or running.

4.2 Cylinder

4.2.1 LPG cylinder, if permanently fitted or otherwise, shall conform to IS 3196 (Part 1). Cylinders shall be approved/endorsed by the PESO (Petroleum Explosives Safety Organization) as per *Gas Cylinder Rules*, 2004 (as amended from time to time).

4.2.2 Cylinders shall be re-tested as per *Gas Cylinder Rules*, 2004 (as amended from time to time).

4.3 Cylinder Valve/Multi-functional Valve

Each cylinder shall have a manual cylinder shut-off valve mounted directly on it capable of shutting off all gas flow from that cylinder. Cylinders and shut-off valve assemblies shall be approved/endorsed by the Department of Explosives, as per IS 8737 and *Gas Cylinder Rules*, 2004 (as amended from time to time).

4.4 Pressure Regulator/Vapourizer

The pressure regulator/vapourizer shall conform to IS 4786 or IS 9798 or ECE R-67.

4.5 LPG Fuel Line

LPG fuel pipe and its connections for use shall conform to IS 9573.

4.6 Gas/Air Mixer

Ensure gas-air mixer is securely mounted. Leak test using non-corrosive foaming agent or by LPG leak detector. It should not react with LPG mixture.

4.7 Refilling Valve

If permanently fitted, shall be checked for following safety checks:

a) Check for dust cap/plug;
b) Check that engine should not start when dust cap/plug is removed or open; and
c) Check leakage for non-return valve using non corrosive foaming agent or LPG leak.

5 PERFORMANCE REQUIREMENTS

5.1 Power rating of LPG operated IC engine shall be declared by the manufacturer in accordance with IS 7347.

5.2 LPG operated IC engine shall meet the performance requirement as specified in IS 7347.

6 MARKING

6.1 The engine shall be clearly marked with the following:

a) Rated output, in kW;
b) Rated speed, in rev/min;
c) Specific fuel/gas consumption (SFC), in g/kWh;
d) Manufacturer's name or trade-mark and code number; and
e) Model No.

6.2 BIS Certification Marking

Each engine may also be marked with the BIS Standard Mark.

6.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clause* 3)

TECHNICAL SPECIFICATION OF LPG KIT

A-1 DETAILS OF KIT MANUFACTURER/SUPPLIER

a) Name of the manufacturer;
b) Telephone No; and
c) Contact person.

A-2 KIT IDENTIFICATION NO.

a) Name of the manufacturer; and
b) Identification No.

A-3 LPG CYLINDER, IF FITTED (PESO APPROVED/ENDORSED)

a) Name of the manufacturer;
b) Identification No;
c) Type;
d) Maximum test pressure, in kg/cm^2;
e) Working pressure, in kg/cm^2;
f) Cylinder capacity (water equivalent);
g) Approval reference from PESO; and
h) Validity of approval.

A-4 CYLINDER VALVE/MULTI-FUNCTION VALVE ASSEMBLY (PESO APPROVED/ENDORSED), IF ANY

a) Multi-function valve shall have the following:
    1) Automatic fill limiter;
    2) Excess flow check valve;
    3) Pressure relief device;

    4) Content gauge;
    5) Inlet connected to the fill connector having non-return valve;
    6) Fusible plug; and
    7) Service valve.

b) Name of the manufacturer;
c) Model name/Identification No;
d) Maximum test pressure, in kg/cm^2; and
e) Working pressure, in kg/cm^2.

A-5 LPG SOLENOID VALVE, IF FITTED/ APPLICABLE

a) Name of the manufacturer;
b) Model name/Identification No.;
c) Type;
d) Working pressure, in kg/cm^2; and
e) Maximum test pressure, in kg/cm^2.

A-6 SOLENOID VALVE, IF FITTED/APPLICABLE

a) Name of the manufacturer;
b) Model name/Identification No.;
c) Working pressure, in kg/cm^2; and
d) Maximum test pressure, in kg/cm^2.

A-7 REFILLING VALVE, IF FITTED/ APPLICABLE

a) Name of the manufacturer;
b) Model name/Identification No.;
c) Working pressure, in kg/cm^2; and
d) Maximum test pressure, in kg/cm^2.

A-8 PRESSURE REGULATOR/VAPORIZER, IF FITTED/APPLICABLE

a) Name of the manufacturer;
b) Model name/Identification No.;
c) Inlet pressure, in kg/cm^2;
d) Outlet pressure, in kg/cm^2; and
e) Number of stages.

A-9 LPG FILTER, IF FITTED/APPLICABLE

a) Name of the manufacturer;
b) Model name/Identification No.;
c) Inlet pressure, in kg/cm^2; and
d) Outlet pressure, in kg/cm^2.

A-10 OIL PUMP OR LUBRICATION SYSTEM, IF ANY

a) Name of the manufacturer.

A-11 HIGH PRESSURE/LOW PRESSURE TUBING (RUBBER HOSE LPG AS PER IS 9573)

a) Name of the manufacturer;
b) Model name/Identification No.;
c) Working pressure, in kg/cm^2 ;
d) Maximum test pressure, in kg/cm^2;
e) Outer diameter/Inner diameter; and
f) Protection quality (material used).

A-12 GAS-AIR MIXER

a) Name of the manufacturer; and
b) Identification number/model name/part number.

A-13 ON/OFF SWITCH, IF ANY

a) Name of the manufacturer; and
b) Model name/Identification No.

A-14 IGNITION SYSTEM AND WIRING HARNESS (FOR LPG SYSTEM), IF ANY

a) Name of the manufacturer;
b) Type of ignition system;
c) Spark plug gap, mm; and
d) Electrical circuit diagram.

A-15 INTERFACING UNIT (FOR CLOSED LOOP ENGINES)

a) Name of the manufacturer; and
b) Model name/Identification No.

A-16 TIMING ADVANCER, IF ANY

a) Name of the manufacturer; and
b) Timing on LPG mode.

A-17 BRIEF DESCRIPTION OF SYSTEM INCLUDING DIMENSIONAL LAYOUT FOR CYLINDER AND OTHER KIT COMPONENT INSTALLATIONS

A-18 ANY OTHER INFORMATION (NOT COVERED)

a) To be incorporated by the manufacturer.

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Automotive Primemovers, Transmission and Steering Systems and Internal Combustion Engines Sectional Committee, TED 2

Organization	*Representative(s)*
Automotive Research Association of India, Pune	Shri M. K. Choudhari (***Chairman***) Shri H. A. Nakhva (*Alternate*)
Ashok Leyland Ltd, Chennai	Shri J. Sekhar Shri S. Arun (*Alternate*)
Association of State Road Transport Undertakings, New Delhi	Shri S. K. Partra Shri R. Chandrababu (*Alternate*)
Automotive Components Manufacturers Association of India, New Delhi	Shri Arvind Kumar Gupta Shri K. N. D. Nambudripad (*Alternate*)
Bajaj Auto Ltd, Pune	Shri R. Narsimha Shri A. V. Kumbhar (*Alternate*)
Bharat Earth Movers Ltd, Mysore	Shri A. S. Thamil Selvan Shri A. Thanumalayan (*Alternate*)
Bosch Ltd, Bangalore	Shri M. R. Gopalakrishna Shri S. P. Guheshwara (*Alternate*)
Central Institute of Road Transport, Pune	Shri K. Mohamamed Nazar Shri M. M. Pathak (*Alternate*)
Controllerate Quality Assurance (HV), Chennai	Shri Nagendra Pal Shri Ganesh Parsad (*Alternate*)
Cummins India Ltd, Pune	Shri Abhay P. Bhagwat
DGS&D (Quality Assurance), New Delhi	Shri S. C. Mondal Shri A. Tirkey (*Alternate*)
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Hero Honda Motor Ltd, Dharuheda	Shri Nitish Talwar Shri Sanjeev Tandon (*Alternate*)
HMT Ltd (Tractor Division), Pinjore	Shri Atol Kumar Shri N. K. Choudhary (*Alternate*)
Indian Diesel Engine Manufacturers Association, Agra	Shri Ramesh S. Pasrija Shri M. S. N. Murty (*Alternate*)
Indian Institute of Petroleum, Dehradun	Dr S. K. Singhal Shri Nishan Singh (*Alternate*)
Indian Institute of Technology (IIT), New Delhi	Dr S. P. Singh Shri Sudipto Mukherjee (*Alternate*)
ICAT, Manesar	Shri Shekar Gupta Shri U. K. Bhatt (*Alternate*)
Mahindra & Mahindra, Nasik	Dr Mathew Abraham Shri Sanjay Gill (*Alternate*)
Maruti Suzuki Ltd, Gurgaon	Shri Shiva Kumar
Ministry of Heavy Industries & Public Enterprises, New Delhi	Shri V. C. Mathur Shri B. N. Das (*Alternate*)
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Rajkot Engineering Association, Rajkot	Shri Jayant Pithwa Shri V. Nagraj (*Alternate*)

Organization	*Representative(s)*
Rane TRW Steering System Ltd, Singaperumal Koil	SHRI S. MOHAN SHRI K. N. SURESH (*Alternate*)
Society of Indian Automobile Manufacturers, New Delhi	SHRI K. K. GANDHI
Sona Koyo Steering Systems Ltd, Gurgaon	SHRI A. D. RAO SHRI A. K. SINGH (*Alternate*)
Tata Motors Ltd, Pune	SHRI S. R. GORE SHRI M. RAVI (*Alternate*)
Tractor Manufacturers Association, New Delhi	SHRI T. C. GOPALAN SHRI V. K. TANEJA (*Alternate*)
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SHRI P. S. MUJRAL
Scientist 'E' (TED), BIS

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Amend No.	Date of Issue	Text Affected

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